# United States Patent [19]

**Bennett**

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[54] **FLUID-POWERED SUBMERSIBLE SAMPLING PUMP**


[76] Inventor: **Robert W. Bennett**, 5116 Bonham, Amarillo, Tex. 79110



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[52] **U.S. Cl.** ..... **417/397**; 417/403; 417/390; 91/313

[58] **Field of Search** ..... 417/390, 403, 404, 393, 417/397; 91/313, 329, 348



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*Primary Examiner*—Leonard E. Smith

*Attorney, Agent, or Firm*—William R. Laney; Robert M. Hessin; Lucian Wayne Beavers



[57] **ABSTRACT**

A small diameter fluid-driven pump for subterranean fluid sampling, and including an elongated cylindrical body formed by a centrally disposed control valve block assembly and a pair of hollow motor piston chambers on opposite sides of the valve block and joined thereto. Within the centrally disposed control valve block assembly in axial alignment with the motor pistons are a spool pilot valve and a spool fluid distribution valve. The spool pilot valve is constructed to obviate stalling during its reciprocation under the impress of a power fluid directed thereto, and it functions to control the shifting of the distribution valve to which it is internally connected within the valve block assembly.

The spool pilot valve includes a valve housing defining a large central piston chamber, a relatively small bore extending axially inwardly from one end of the valve housing, and into communication with the large central piston chamber, and a larger bore of smaller diameter than the central piston chamber extending axially into the opposite end of the valve housing into communication with the central piston chamber. A small piston is slidably positioned in the relatively small bore, a larger piston in the larger bore and a largest piston in the central piston chamber. A power fluid charging port communicates with the central piston chamber through the valve housing, and inlet and exhaust ports communicate with each of the bores. Sealing means on the largest piston in the central piston chamber allows power fluid to bleed from the power fluid charging port to opposite sides of the largest piston when this sealing means is directly aligned with the power fluid charging port.


**25 Claims, 17 Drawing Figures**